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(21) International Application Number: PCT/EP97/00894 (22) International Filing Date: 21 February 1997 (21.02.97) (30) Priority Data: 08/610,565 6 March 1996 (06.03.96) US (71) Applicants: UNILEVER PLC [GB/GB]; Unilever House, Blackfriars, London EC4P 4BQ (GB). UNILEVER N.V. [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL). (72) Inventors: VILLA, Virgilio, Barba; 140 Grove Street, Bergenfield, NJ 07621 (US). KOLODZIEJ, Richard; 770 Anderson Avenue, Cliffside Park, NJ 07010 (US). SHANA'A, May; 200 Old Palisade Road, Fort Lee, NJ 07024 (US). (74) Agent: ELLIOTT, Peter, William; Unilever plc, Patent Division, Colworth House, Sharnbrook, Bedford MK44 1LQ (GB).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: CLEANSING COMPOSITIONS COMPRISING XANTHAN GUM AND CROSS-LINKED POLYACRYLIC ACID (57) Abstract The present invention relates to a novel structuring system comprising both xanthan gum and cross-linked polyacrylic acid polymer which combination unexpectedly has been found to provide enhanced stability for large size benefit agent droplets in an amphoteric/anionic surfactant system relative to use of either structurant alone.		

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CLEANSING COMPOSITIONS COMPRISING XANTHAN GUM AND CROSS-LINKED POLY-
ACRYLIC ACID

5

FIELD OF THE INVENTION

10

The present invention relates to liquid shower gel compositions comprising oils/emollients as benefit agents. In particular, the application relates to combination of both xanthan gum and cross-linked polyacrylic acid polymers which unexpectedly has been found capable of stably suspending large size oil/emollient droplets better than either one alone.

15

BACKGROUND

20

Liquid cleanser compositions providing some kind of benefit agent are known in the art. Thus, for example, the use of silicones, oils and other emollients in liquid compositions for providing skin care benefit is known.

25

One method of enhancing the delivery of the benefit agent (e.g., vegetable oil, silicone) to the skin or hair, for example, is through the use of cationic hydrophilic polymers such as Polymer JR^(R) from Americhol or Jaguar^(R) from Rhone Poulenc (see WO 94/03152). In this reference generally small sized silicone particles are uniformly distributed throughout the liquid cleanser.

30

Another way of enhancing delivery of benefit agent is utilizing larger size benefit agent particles. To suspend such particles without causing separation of the particles or oil droplets (e.g., flocculation, coalescence, creaming or breaking), however, is not an easy task.

35

One way of suspending larger size particles is through the use of thickeners such as xanthan gum. Xanthan gum thickeners are taught, for example, in U.S. Patent No. 4,364,837 to Pader (see column 22, Table II, example 16); and
5 in U.S. patent No. 4,788,006 to Bolich Jr.

U.S. Patent No. 4,541,610 to Grollier (L'Oreal) teaches thickened or gelled hair conditioning compositions which use xanthan gum as thickener. All the examples appear to
10 exemplify only a cationic surfactant as principal surfactant and there appears to be no teaching of an oil or emollient, let alone a disclosure of particle size.

Several patents also disclose the use of a cross-linked
15 polyacrylic type polymer with silicone. U.S. Patent No. 5,085,857 to Reid et al., for example, teaches in example 1 a Carbopol^(R) in combination with silicone oil. There is no teaching of xanthan gum, however, and the silicone oil is an emulsion, i.e., not large sized silicone droplets (typically
20 median particle sizes of emulsions are about 0.3 to 0.5 microns).

U.S. Patent No. 5,344,643 to Thiel teaches shampoo compositions comprising an oily conditioning agent, (e.g.,
25 silicone), a carboxyvinyl polymer, a cationic conditioning agent and water. There is no teaching of xanthan gum.

U.S. Patent No. 5,409,695 to Abrutyn et al. teaches a method of depositing silicone by entrapping silicone in a
30 nontoxic hydrophobic macroporous highly x-linked polymer. There is no xanthan gum.

SUMMARY OF THE INVENTION

5 Suddenly and unexpectedly, applicants have found that when xanthan gum and cross-linked polyacrylic acid polymer saturated compounds (e.g., polyacrylate or polymethacrylate) are used in the specified surfactant system of the invention, they stably suspend large benefit agent particles. By contrast, when xanthan gum or cross-linked polyacrylic acid polymer is used alone, the benefit agent cannot be suspended without separation.

Specifically, in one embodiment of the invention, the invention comprises a liquid cleansing composition comprising:

- 15 (1) 5% to 50% by wt. of a surfactant system comprising
 - (a) anionic surfactant or mixture of anionic surfactants; and
 - (b) an amphoteric and/or zwitterionic surfactant or mixture thereof;
- 20 (2) 0.1% to 20% by wt., preferably 0.5 to 15% by wt., most preferably 1% to 12% by wt. of a benefit agent of defined particle size (e.g., silicone oil);
- (3) 0.01 to 5.0%, preferably 0.05 to 2.0%, most preferably 0.1 to 1.5% by wt. xanthan gum; and
- 25 (4) 0.01 to 5.0%, preferably 0.05 to 2.0%, most preferably 0.1 to 1.0% by weight of a cross-linked polyacrylic acid polymer (e.g., polyacrylate or polymethacrylate).

30 In a second embodiment of the invention, the invention comprises a method for stably suspending large size benefit agent particles (i.e., 1 to 500 microns, preferably 2 to 200 microns, more preferably 2 to 100 microns) using the compositions of the invention.

DETAILED SUMMARY OF THE INVENTION

The present invention relates to a liquid detergent composition comprising a structurant system capable of suspending large size (e.g., 1 to 500 microns) benefit agent particles. The structurant system comprises a combination of xanthan gum and cross-linked polyacrylic acid polymers such as cross-linked polyacrylates or methacrylates.

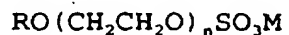
Surfactants

The surfactant system of the subject invention comprises 5 to 50% by weight, preferably 10 to 40% by wt. of the composition and comprises:

- (a) one or more anionic surfactants;
- (b) amphoteric and/or zwitterionic surfactant; and
- (c) optional nonionic surfactant

The anionic surfactant may be, for example, an aliphatic sulfonate, such as a primary alkane (e.g., C_8-C_{22}) sulfonate, primary alkane (e.g., C_8-C_{22}) disulfonate, C_8-C_{22} alkene sulfonate, C_8-C_{22} hydroxyalkane sulfonate or alkyl glyceryl ether sulfonate (AGS); or an aromatic sulfonate such as alkyl benzene sulfonate.

The anionic may also be an alkyl sulfate (e.g., $C_{12}-C_{18}$ alkyl sulfate) or alkyl ether sulfate (including alkyl glyceryl ether sulfates). Among the alkyl ether sulfates are those having the formula:

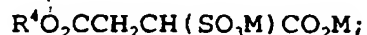


wherein R is an alkyl or alkenyl having 8 to 18 carbons, preferably 12 to 18 carbons, n has an average value of greater than 1.0, preferably between 2 and 4; and M is a

solubilizing cation such as sodium, potassium, magnesium, ammonium or substituted ammonium, magnesium, ammonium and sodium lauryl ether sulfates are preferred.

The anionic may also be alkyl sulfosuccinates (including mono- and dialkyl, e.g., C₆-C₂₂ sulfosuccinates); alkyl and acyl taurates, alkyl and acyl sarcosinates, sulfoacetates, C₈-C₂₂ alkyl phosphates and phosphates, alkyl phosphate esters and alkoxyl alkyl phosphate esters, acyl lactates, C₈-C₂₂ monoalkyl succinates and maleates, sulphoacetates, and acyl isethionates.

Sulfosuccinates may be monoalkyl sulfosuccinates having the formula:

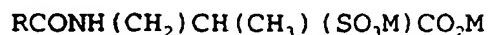


amido-MEA sulfosuccinates of the formula



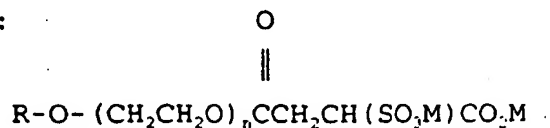
wherein R⁴ ranges from C₈-C₂₂ alkyl and M is a solubilizing cation;

amido-MIPA sulfosuccinates of formula



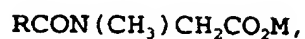
where M is as defined above.

Also included are the alkoxylated citrate sulfosuccinates; and alkoxylated sulfosuccinates such as the following:



wherein $n = 1$ to 20; and M is as defined above.

Sarcosinates are generally indicated by the formula



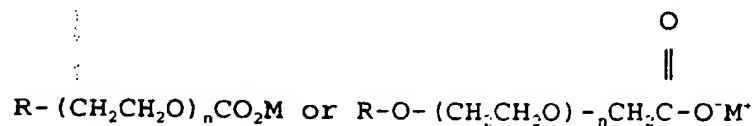
wherein R ranges from C_8 to C_{20} alkyl and M is a solubilizing cation.

Taurates are generally identified by formula



wherein R^2 ranges from C_8 - C_{20} alkyl, R^3 ranges from C_1 - C_4 alkyl and M is a solubilizing cation.

Another class of anionics are carboxylates such as follows:



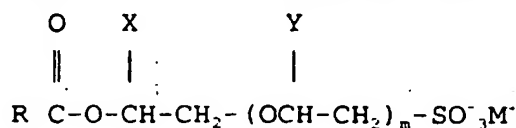
wherein R is C_8 to C_{20} alkyl; n is 0 to 20; and M is as defined above.

Another carboxylate which can be used is amido alkyl polypeptide carboxylates such as, for example, Monteine LCQ^(R) by Seppic.

Another surfactant which may be used are the C_8 - C_{18} acyl isethionates. These esters are prepared by reaction between alkali metal isethionate with mixed aliphatic fatty acids having from 6 to 18 carbon atoms and an iodine value of less than 20. At least 75% of the mixed fatty acids have from 12 to 18 carbon atoms and up to 25% have from 6 to 10 carbon atoms.

Acyl isethionates, when present, will generally range from about 0.5-15% by weight of the total composition. Preferably, this component is present from about 1 to about 10%.

The acyl isethionate may be an alkoxyated isethionate such as is described in Ilardi et al., U.S. Patent No. 5,393,466, hereby incorporated by reference into the subject application. This compound has the general formula:

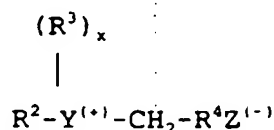


wherein R is an alkyl group having 8 to 18 carbons, m is an integer from 1 to 4, X and Y are hydrogen or an alkyl group having 1 to 4 carbons and M⁺ is a monovalent cation such as, for example, sodium, potassium or ammonium.

In general the anionic component will comprise from about 1 to 25% by weight of the composition, preferably 2 to 20%, most preferably 5 to 15% by weight of the composition.

Zwitterionic and Amphoteric Surfactants

Zwitterionic surfactants are exemplified by those which can be broadly described as derivatives of aliphatic quaternary ammonium, phosphonium, and sulfonium compounds, in which the aliphatic radicals can be straight or branched chain, and wherein one of the aliphatic substituents contains from about 8 to about 18 carbon atoms and one contains an anionic group, e.g., carboxy, sulfonate, sulfate, phosphate, or phosphonate. A general formula for these compounds is:



wherein R² contains an alkyl, alkenyl, or hydroxy alkyl radical of from about 8 to about 18 carbon atoms, from 0 to about 10 ethylene oxide moieties and from 0 to about 1 glyceryl moiety; Y is selected from the group consisting of nitrogen, phosphorus, and sulfur atoms; R³ is an alkyl or monohydroxyalkyl group containing about 1 to about 3 carbon atoms; X is 1 when Y is a sulfur atom, and 2 when Y is a nitrogen or phosphorus atom; R⁴ is an alkylene or hydroxyalkylene of from about 1 to about 4 carbon atoms and Z is a radical selected from the group consisting of carboxylate, sulfonate, sulfate, phosphonate, and phosphate groups.

Examples of such surfactants include:

4-[N,N-di(2-hydroxyethyl)-N-octadecylammonio]-butane-1-carboxylate;

5-[S-3-hydroxypropyl-S-hexadecylsulfonio]-3-hydroxypentane-1-sulfate;

3-[P,P-diethyl-P-3,6,9-trioxatetradecylphosphonio]-2-hydroxypropane-1-phosphate;

3-[N,N-dipropyl-N-3-dodecoxy-2-hydroxypropylammonio]-propane-1-phosphonate;

3-(N,N-dimethyl-N-hexadecylammonio)propane-1-sulfonate;

3-(N,N-dimethyl-N-hexadecylammonio)-2-hydroxypropane-1-sulfonate;

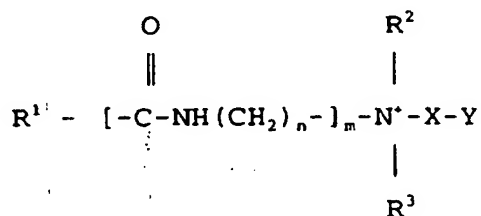
4-[N,N-di(2-hydroxyethyl)-N-(2-hydroxydodecyl)ammonio]-butane-1-carboxylate;

3-[S-ethyl-S-(3-dodecoxy-2-hydroxypropyl)sulfonio]-propane-1-phosphate;

3-[P,P-dimethyl-P-dodecylphosphonio]-propane-1-phosphonate; and

5-[N,N-di(3-hydroxypropyl)-N-hexadecylammonio]-2-hydroxy-pentane-1-sulfate.

Amphoteric detergents which may be used in this invention include at least one acid group. This may be a carboxylic or a sulphonic acid group. They include quaternary nitrogen and therefore are quaternary amido acids. They should generally include an alkyl or alkenyl group of 7 to 18 carbon atoms. They will usually comply with an overall structural formula:



where R¹ is alkyl or alkenyl of 7 to 18 carbon atoms;

R² and R³ are each independently alkyl, hydroxyalkyl or carboxyalkyl of 1 to 3 carbon atoms;

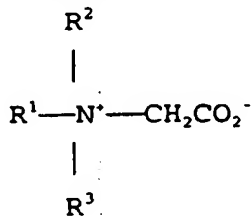
n is 2 to 4;

m is 0 to 1;

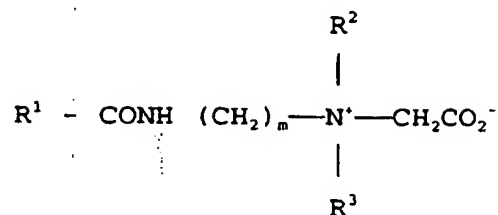
X is alkylene of 1 to 3 carbon atoms optionally substituted with hydroxyl, and

Y is -CO₂- or -SO₃-

Suitable amphoteric detergents within the above general formula include simple betaines of formula:



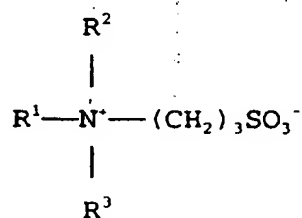
and amido betaines of formula:



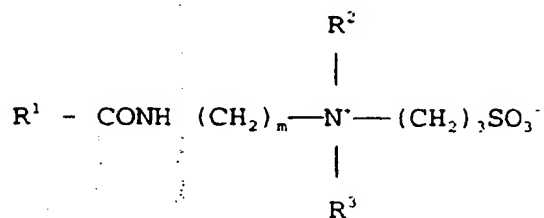
where m is 2 or 3.

In both formulae R^1 , R^2 and R^3 are as defined previously. R^1 may in particular be a mixture of C_{12} and C_{14} alkyl groups derived from coconut so that at least half, preferably at least three quarters of the groups R^1 have 10 to 14 carbon atoms. R^2 and R^3 are preferably methyl.

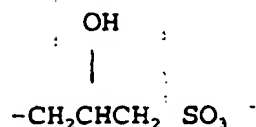
A further possibility is that the amphoteric detergent is a sulphobetaine of formula



or



where m is 2 or 3, or variants of these in which $(\text{CH}_2)_3\text{SO}_3^-$ is replaced by



5 In these formulae R^1 , R^2 and R^3 are as discussed previously.

10 Amphoacetates and diamphoacetates are also intended to be covered in possible zwitterionic and/or amphoteric compounds which may be used.

 The amphoteric/zwitterionic generally comprises 0.1 to 20% by weight, preferably 5% to 15% of the composition.

15 In addition to one or more anionic and amphoteric and/or zwitterionic, the surfactant system may optionally comprise a nonionic surfactant.

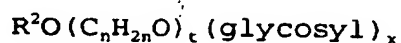
20 The nonionic which may be used includes in particular the reaction products of compounds having a hydrophobic group and a reactive hydrogen atom, for example aliphatic alcohols, acids, amides or alkyl phenols with alkylene oxides, especially ethylene oxide either alone or with propylene oxide. Specific nonionic detergent compounds are alkyl
25 (C_6 - C_{22}) phenols-ethylene oxide condensates, the condensation products of aliphatic (C_8 - C_{18}) primary or secondary linear or branched alcohols with ethylene oxide, and products made by condensation of ethylene oxide with the reaction products of propylene oxide and ethylenediamine. Other so-called
30 nonionic detergent compounds include long chain tertiary amine oxides, long chain tertiary phosphine oxides and dialkyl sulphoxides.

35 The nonionic may also be a sugar amide, such as a polysaccharide amide. Specifically, the surfactant may be

one of the lactobionamides described in U.S. Patent No. 5,389,279 to Au et al. which is hereby incorporated by reference or it may be one of the sugar amides described in Patent No. 5,009,814 to Kelkenberg, hereby incorporated into the subject application by reference.

Other surfactants which may be used are described in U.S. Patent No. 3,723,325 to Parran Jr. and alkyl polysaccharide nonionic surfactants as disclosed in U.S. Patent No. 4,565,647 to Llenado, both of which are also incorporated into the subject application by reference.

Preferred alkyl polysaccharides are alkylpolyglycosides of the formula



wherein R^2 is selected from the group consisting of alkyl, alkylphenyl, hydroxyalkyl, hydroxyalkylphenyl, and mixtures thereof in which alkyl groups contain from about 10 to about 18, preferably from about 12 to about 14, carbon atoms; n is 0 to 3, preferably 2; t is from 0 to about 10, preferably 0; and x is from 1.3 to about 10, preferably from 1.3 to about 2.7. The glycosyl is preferably derived from glucose. To prepare these compounds, the alcohol or alkylpolyethoxy alcohol is formed first and then reacted with glucose, or a source of glucose, to form the glucoside (attachment at the 1-position). The additional glycosyl units can then be attached between their 1-position and the preceding glycosyl units 2-, 3-, 4- and/or 6-position, preferably predominantly the 2-position.

Nonionic comprises 0 to 10% by wt. of the composition.

Oil/Emollient

One of the principal benefits of the invention is the ability to suspend large particle size oil/emollient particles in an isotropic phase composition.

Various classes of oils are set forth below.

Vegetable oils: Arachis oil, castor oil, cocoa butter, coconut oil, corn oil, cotton seed oil, jojoba oil, olive oil, palm kernel oil, safflower oil, rapeseed oil, sunflower seed oil, sesame seed oil and soybean oil.

Esters: Butyl myristate, cetyl palmitate, decyloleate, glyceryl laurate, glyceryl ricinoleate, glyceryl stearate, glyceryl isostearate, hexyl laurate, isobutyl palmitate, isocetyl stearate, isopropyl isostearate, isopropyl laurate, isopropyl linoleate, isopropyl myristate, isopropyl palmitate, isopropyl stearate, propylene glycol monolaurate, propylene glycol ricinoleate, propylene glycol stearate, propylene glycol isostearate, glycerol trioctanoate, glyceryl tricaprilate/tricaprate, isostearyl isostearate, pentaerythrityl tetraistearate.

Animal Fats: Acetylated lanolin alcohols, lanolin, lard, mink oil and tallow.

Fatty acids and alcohols: Behenic acid, palmitic acid, stearic acid, behenyl alcohol, cetyl alcohol, eicosanyl alcohol and isocetyl alcohol.

Other examples of oil/emollients include mineral oil, petrolatum, beeswax, polyisobutene, silicone oil such as dimethyl polysiloxane, lauryl and myristyl lactate.

The emollient/oil is generally used in an amount from about 1 to 20%, preferably 1 to 15% by wt. of the composition. Generally, it should comprise no more than 20% of the composition.

The particles of the invention generally have a size of 1 to 500, preferably 2 to 200, most preferably 2 to 100 microns.

An especially preferred oil is silicone oil, in particular, dimethicone having viscosity of 60,000 centistokes.

Xanthan Gum

The xanthan gums used according to the present invention are known per se and are polysaccharides which can be synthesized by fermentation of certain sugars by microorganisms, such as the bacterium *Xanthomonas campestris*.

These gums generally have a molecular weight of from 1 million to 50 million and a viscosity of from 850 to 1,600 cps for an aqueous composition containing 1% of xanthan gum (gum was present in a 1% KCl solution and was measured on a viscometer of the Brookfield LV type, at 60 revolutions/minute using Spindle No. 3).

Gums which are more particularly preferred according to the invention are commercial products, such as Keltrol, marketed by Kelco, Rhodopol 23 C, marketed by Rhone-Poulenc, Actigum CX 9, marketed by Ceca, and Deuteron XG, marketed by Schoner.

The xanthan gum generally will comprise from 0.01 to 5.0% by wt. of the cleanser composition. Preferably, the gum

should comprise 0.1 to 1.5% by wt. of the composition.

Cross-Linked Polyacrylic Acid Polymer

5 The second component of the structuring system (in addition to xanthan gum) is the cross-linked polyacrylic acid polymer. Preferably, this is a cross-linked polyacrylate or polymethacrylate compound. Examples of such compounds
10 include Carbopol^(R) and Pemulen^(R) from B. F. Goodrich; and Acritamer^(R) from RITA.

The cross-linked structurant generally comprises 0.01 to
15 5.0% by wt., preferably 0.05 to 2.0 by wt. of the liquid composition.

In addition, the compositions of the invention may include optional ingredients as follows:

20 Organic solvents, such as ethanol; auxiliary thickeners, such as carboxymethylcellulose, magnesium aluminum silicate, hydroxyethylcellulose, methylcellulose, glucamides, or Antil^(R) from Rhone Poulenc; perfumes; sequestering agents,
25 such as tetrasodium ethylenediaminetetraacetate (EDTA), EHDP or mixtures in an amount of 0.01 to 1%, preferably 0.01 to 0.05%; and coloring agents, opacifiers and pearlizers such as zinc stearate, magnesium stearate, TiO₂, EGMS (ethylene glycol monostearate) or Lytron 621 (Styrene/Acrylate
30 copolymer); all of which are useful in enhancing the appearance or cosmetic properties of the product.

The compositions may further comprise antimicrobials
such as 5-chloro-2-(2,4-Dichlorophenoxy) phenol phenol
35 (DP300); preservatives such as 1,3-Dimethylol-5,5-

dimethylhydantoin (Glydant XL1000), parabens, sorbic acid etc.

5 The compositions may also comprise coconut acyl mono- or diethanol amides as suds boosters, and strongly ionizing salts such as sodium chloride and sodium sulfate may also be used to advantage.

10 Antioxidants such as, for example, butylated hydroxytoluene (BHT) may be used advantageously in amounts of about 0.005% or higher if appropriate.

15 Cationic conditioners which may be used include Quatrisoft LM-200 Polyquaternium-24, Merquat Plus 3330 - Polyquaternium 39, Jaguar^(R) type conditioners (including guar gum), polymethacrylamido propyl chloride, polyquaternium 37 and polyquaternium 10.

20 Polyethylene glycols which may be used include:

Polyox	WSR-205	PEG 14M,
Polyox	WSR-N-60K	PEG 45M, or
Polyox	WSR-N-750	PEG 7M.

25 Thickeners which may be used include Amerchol Polymer HM 1500 (Nonoxynyl Hydroethyl Cellulose); Glucam DOE 120 (PEG 120 Methyl Glucose Dioleate); Rewoderm^(R) (PEG modified glyceryl cocoate, palmate or tallowate) from Rewo Chemicals; Antil^(R) 141 (from Goldschmidt); ammonium sulfate, and sodium chloride.

30

35 Another optional ingredient which may be added are the deflocculating polymers such as are taught in U.S. Patent No. 5,147,576 to Montague, hereby incorporated by reference.

Another ingredient which may be included are exfoliants such as polyoxyethylene beads, ground walnut shells and ground apricot seeds.

5 In a second embodiment of the invention, the invention relates to a method of stabilizing large size benefit droplets in specific surfactant systems using the combination of xanthan gum and cross-linked polyacrylic acid polymers as a structuring system.

10 EXAMPLES

Protocol

15 Assessment of Stability was done by one of the 4 following mechanisms.

- (1) Visual assessment based on 2-phase separation;
- 20 (2) Microscopy - determination of presence of benefit agent droplets at different points (i.e., top and bottom) of sample;
- (3) Particle size distribution - laser scattering based particle size/particle size distribution at different sampling points; and
- 25 (4) Determination of theoretical creaming rate of the droplets.

Product stability for compositions of the invention (using most of the techniques described above) was assessed
30 using accelerated conditions (i.e., 1 week minimum at 125°F).

Using the accelerated conditions noted above, compositions 1-13 were prepared and assessed as follows:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Cocoamidopropyl Betaine	10	10	10	10	10	10	10	10	10	10	10	10	10	8	8
Sodium Cocyl Isethionate	5	5	5	5	5	5	5	5	5	5	5	5	5	4	4
Sodium Laureth Sulfate	5	5	5	5	5	5	5	5	5	5	5	5	5	3	3
Dimethicone (60,000 cst)	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Carbopol ETD 2020 ¹	0.2	0.4	0.6	0.8	-	-	0.4	0.4	-	-	0.4	0.4	0.4	0.4	0.4
Xanthan Gum	-	-	-	-	-	-	-	-	0.1	0.2	0.05	0.1	0.2	0.2	0.3
Polysurf 67 ²	-	-	-	-	0.1	0.2	0.1	0.2	-	-	-	-	-	-	-
Opacifier/Colorant	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Perfume/Preservative	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Diluent, Water to	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Produce Separation ³	V	V	V	V	V	V	V	V	V	V	NV	NV	NV	NV	NV

¹ Acrylate/C10-C30 Alkyl Acrylate Copolymer² Cetyl Hydroxyethyl Cellulose³ V (Visible separation), NV (No Visible Sign of Instability); Assessments Made After 1 Week at 125°F

Example 1

As seen from Table 1, benefit agent (e.g., silicone) was suspended in the following structurant systems (1) where Carbopol (0.2% to 0.8%) was sole structurant (Examples 1-4); (2) where Polysurf 67, cetyl hydroxyethylcellulose (0.1% to 0.2%), was sole structurant (Examples 5 and 6); (3) where Ketrol RD, xanthan gum (0.1 to 0.2%) was sole structurant (Example 9 and 10); (4) where Carbopol and xanthan together were used together as structurants (Examples 11-13) and (5) where Carbopol and Polysurf 67 together were used as structurants (Examples 7 and 8).

It was clearly noted by visual assessment using the protocol noted above that any of the three alone (Groups (1) - (3)) or Carbopol plus Polysulf (Group (5)) were unstable. By contrast, Carbopol plus xanthan (Group (4)) (Examples 11-13) were visually stable (i.e., no visible sign of instability over accelerated conditions).

Thus, there was clearly an unexpected enhancement in stability when these two specific structurants were used together.

It should be noted that the same results were observed in lower surfactant systems (Example 14 and 15).

Example 2

	% (by weight)
Cocamidopropyl Betaine	10.0
Sodium Cocyl Isethionate	5.0
Sodium Laureth Sulfate	5.0
Dimethicone (60,000 cst)	5.0
Carbopol ETD 20201	0.4
Xanthan Gum	0.2
Opacifier/Colorant	0.6
Perfume/Preservative	1.2
Diluent, Water to	100.0

The above composition was prepared according to the procedure described below comprising about 20% surfactants, 0.4% Carbopol, 0.2% Xanthan Gum and 5% Silicone.

Using microscopy technique (there was no visual separation), sample from top and bottom layers were compared at 100X magnification and it was found that oil droplets were uniformly distributed. Applicants then took a quantative determination of oil droplet size distribution from both top and bottom layers after 3 weeks at 125°F, using the Mastersizer (laser scattering based particle analyzer) and the following results were noted:

	Top Layer	Bottom Layer
Mean Particle Size (μm) ¹	18.87	25.24
Mode (μm)	21.89	22.08
D ₉₀ (90th Percentile) ²	31.89	34.81

¹ mean particle size over the volume distribution (Herdan or Brouckere diameter).

² 90% of particles are equal or less than this value.

Noting that particle sizes in both layers are extremely close in size after 3 weeks at 125°F, it is clear that the product is stable.

The procedure by which Example 2 composition was made is as follows:

1. Charge water into the mixing vessel.
2. Add Sodium Cocoyl Isethionate into the vessel and heat the mixture to 160-170°F.
3. Add Sodium Laureth Sulfate/pearlizer blend and continue mixing.
4. Add Carbopol ETD202 premix into the mix and neutralize to pH = 5.5 - 6.5.
5. Add opacifier.
6. Add Dimethicone 60,000 cst and mix for 20 minutes.
7. Add Xanthan gum submix.
8. Add diluent to reduce viscosity.
9. Add Cocamidopropyl betaine and continue mixing.
10. Add preservative and perfume.
11. At 95°F, check product viscosity, appearance, consistency and add diluent as needed in order to attain acceptable rheology.

Example 3

Example 3 composition was similar to Example 2 but was subjected to lower shear rate.

In another example using the same chemical composition as in Example 2, except that silicone oil is subject to lower shear rate, the result of visual and microscopic determination of product separation revealed no signs of instability. This was confirmed when particle size measurements was taken on sample that was stored after 7 weeks at 125°F as shown below:

	Top Layer	Bottom Layer
Mean Particle Size (μm) ¹	41.74	45.01
Mode (μm)	41.32	40.93
D ₉₀ (90th Percentile) ²	61.44	62.85

Again, closeness of particle size in top and bottom layers clearly shows that the product is stable.

Example 4

Another method of showing stability is by showing rate of creaming is very low. This rate is measured by Stoke equations;

$$V_s = \frac{2r^2g(\delta - \rho)}{9\eta_0}$$

where:

r = droplet radius, m

g = acceleration due to gravity, 9.807 m/sec²

δ = density of suspending liquid, kg/m³

ρ = density of the droplet, kg/m³

η_0 = viscosity at zero shear rate, Pa s

V_s = creaming velocity, m/sec

Using this equation, the following numbers were
determined for surfactant systems comprising 20% actives.

Surfactant, %	20
Xanthan gum level, %	0.2
r, radius @ 90%-tile (m)	0.00003
g, gravity constant (m/sec ²)	9.807
δ , density of suspending medium (kg/m ³)	1030
ρ , density of droplet (kg/m ³)	970
η_0 , viscosity at zero shear rate (Pa s)*	2,560
V_s , creaming rate (mm/year)	0.36

*Number was obtained by extrapolating from plot of shear rate versus viscosity for very low shear rates.

Using these numbers, the creaming rate at 25°C was determined to be <1.0 mm/year. This again clearly shows the unexpected stability using the xanthan gum/cross-linked polyacrylate polymer structuring system of the invention.

Example 5

The following composition with 15% active was prepared.

	% (by weight)
Cocamidopropyl Betaine	8.0
Sodium Cocyl Isethionate	5.0
Sodium Laureth Sulfate	2.0
Dimethicone (60,000 cst)	5.0
Carbopol ETD 20201	0.4
Xanthan Gum	0.3
Opacifier/Colorant	0.6
Perfume/Preservative	1.2
Diluent, Water to	100.0

The chemical composition above was prepared and analyzed for particle size and results are as follows:

	Top Layer	Bottom Layer
Mean Particle Size (μm) ¹	46.79	51.14
Mode (μm)	48.81	49.36
D ₉₀ (90th Percentile) ²	71.88	78.15

In this example, it can be seen that larger size droplets are found in both top and bottom layers even though less active (i.e., 15% versus 20%) is used.

This example not only confirms that at higher levels of xanthan (0.3% versus 0.2%), there is far less tendency to separate, but it also shows that at lower surfactant levels, the droplet size tends to be larger. While not wishing to be bound by theory, this may be because, at lower surfactant level, less shearing is required and the particles are thus

not so readily broken up.

Theoretical prediction of creaming rate, using the Stoke's equation, is summarized below:

5	Surfactant, %	15
	Xanthan gum level, %	0.3
	r, radius @ 90%-tile (m)	0.000082
	g, gravity constant (m/sec ²)	9.807
10	δ , density of suspending medium (kg/m ³)	1030
	ρ , density of droplet (kg/m ³)	970
	η_0 , viscosity at zero shear rate (Pa s) *	2,440
15	V_s , creaming rate (mm/year)	0.76

Again, creaming rates confirm stability of the composition.

CLAIMS

1. A liquid cleansing composition comprising:
- 5 (a) 5% to 50% by wt. of a surfactant system comprising:
- (i) anionic surfactant or mixture of anionic surfactants; and
- (ii) an amphoteric and/or zwitterionic surfactant or mixtures thereof;
- 10 (b) 0.1% to 20% by wt. of a benefit agent having a particle size of 1 to 500 microns;
- (c) 0.01 to 5.0% by wt. of a xanthan gum; and
- (d) 0.01 to 5.0% by wt. of a cross-linked polyacrylic acid polymer.
- 15 2. A composition as claimed in claim 1, comprising 10% to 40% of said surfactant system.
3. A composition as claimed in either claim 1 or claim 2, wherein said particle size is 2 to 200 microns.
- 20 4. A composition as claimed in any preceding claims, comprising 0.5 to 15% of said benefit agent.
5. A composition as claimed in any preceding claims, wherein said benefit agent is silicone.
- 25 6. A composition as claimed in any preceding claims, comprising 0.05 to 2.0% xanthan gum.
- 30 7. A composition as claimed in any preceding claims, comprising 0.05 to 2.0 polyacrylic acid polymer.
8. A composition as claimed in claim 7, wherein the polymer is polyacrylate or polymethacrylate.
- 35

7. The composition according to claim 2 wherein the capsule further comprises from about 0.01% to about 45%, by volume of the capsule, of a discontinuous phase immiscible with the continuous phase.
8. The detergent composition according to claim 7 wherein the discontinuous phase is an aqueous solution comprising from about 1% to about 10%, by weight of the capsules, of a bleach.
9. A detergent composition comprising:
 - (A) from about 0.01% to about 20%, by weight of the composition of capsules comprising:
 - (a) a hydrophobic continuous phase comprising:
 - (a1) from about 0.1% to about 15%, by weight of the continuous phase, of a diblock co-polymer comprising at least one rigid block and at least one flexible block;
 - (a2) a hydrocarbon oil which forms an isotropic mixture with the block co-polymer;
 - (a3) from about 0.1% to about 60%, by weight of the continuous phase, of a hydrophobic solid; and
 - (B) a surfactant.
10. The detergent composition according to claim 9, wherein the continuous phase further comprises from about 10% to about 60%, by weight of the continuous phase of an oil-soluble benefit agent.
11. A personal care composition comprising:
 - (A) from about 0.01% to about 20%, by weight of the composition, of a capsule comprising:

- (a) a hydrophobic continuous phase comprising:
 - (a1) from about 0.1% to about 15%, by weight of the continuous phase, of a block co-polymer which is selected from the group consisting of a triblock co-polymer, radial co-polymer, and multiblock co-polymer, the co-polymer comprising at least one triblock with a structure: rigid block---flexible block---rigid block; and
 - (a2) a hydrocarbon oil which forms an isotropic mixture with the block co-polymer; and
 - (B) a cosmetically acceptable vehicle.
-
- 12. The personal care composition according to claim 11, wherein the continuous phase further comprises from about 10% to about 60%, by weight of the continuous phase of an oil-soluble benefit agent.
 - 13. The personal care composition according to claim 11 wherein the continuous phase is transparent.
 - 14. The personal care composition of claim 11 wherein the composition is aqueous.
 - 15. The personal care composition according to claim 11 wherein the composition is contained within the transparent package.

INTERNATIONAL SEARCH REPORT

International Application No

PC1/EP 97/00894

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A61K7/50

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A61K A71K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 0 346 097 A (UNILEVER) 13 December 1989 see page 2, line 20 - page 4, line 64; claims 1-20 ---	1-8
Y	EP 0 463 780 A (UNILEVER) 2 January 1991 see page 3, line 44 - line 56; claims 1-13; examples 2,5,8 ---	1-8
P,X	EP 0 738 509 A (COLGATE-PALMOLIVE) 23 October 1996 see claims 1-14 -----	1-8



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Willekens, G

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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